A CASE OF TRAUMA OF THE FOOT OF THE SECOND FRONTAL CONVOLUTION, FOLLOWED BY ATAXIA, NYSTAGMUS AND EPILEPSY.[1]

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A. C.; aged twenty-four; mill-hand; single. Examined June 21, 1899.

Family History.—Mother, aged sixty-five; father, aged sixty-six. Both living and well. One brother, twenty-eight years of age, living and well. One sister, aged twenty-seven, rather delicate.

Personal History.—Had St. Vitus' dance as a child. Never had any serious illness except typhoid fever at twenty years of age. Made a good recovery. He was well at the time that the following injury was received.

On April 20, 1899, he went to Camden, N. J., to see a base ball game. While endeavoring to separate a number of men who were fighting, he was struck on the head with a base ball bat. He sought safety in flight, but while attempting to climb a fence, he received a second blow on the head. We was stunned, but did not become unconscious. He was taken to the office of a nearby physician, who sewed several extensive cuts upon the scalp. He was not removed to his home until the following day, when he came under the care of his family physician. He was unable to talk clearly, and finally became delirious. He was in bed for about five weeks during all of which time he was mentally much confused. Finally convalescence became established and he was able to leave his bed, but he continued to suffer markedly from headache and from difficulty in moving about.

Present Condition.—The patient presents two extensive scars in the frontal region. The first, which runs from before backward, begins just to the left of the median line, about one inch and a quarter from the edge of the scalp. It is an eighth of an inch in width and one inch and three-quarters in length. On the right side of the head, two inches to the right of the median line, a second scar begins, about one inch and a quarter in front of the border of the hair and running backwards. This portion constitutes the stem of a Y-shaped scar, running upwards horizontally for one inch and dividing into two branches. The branches of the Y are curved, the one running slightly upward and the other slightly downward. The second scar is by far the most extensive and apparently the most serious. The scalp is freely movable upon the subjacent bone. No depression can be discovered in the skull. Information received from the physician who attended the patient at the time of the accident is to the effect that no fracture was detected at the time that the scalp was dressed.

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[1] Read at the meeting of the American Neurological Association, September 15, 16 and 17, 1904.

The general examination yields the following results:

Station plus; sway exaggerated, possibly a little more marked in the lateral than the antero-posterior directions. The patient stands with great difficulty upon the right foot alone; cannot balance himself. Stands upon the left foot alone, but the difficulty of balancing is even more marked than when standing upon the right foot. The gait is slightly, but distinctively ataxic. The patient flexes the knees excessively, raises the legs too high and brings his feet down on the floor with a flop. The ataxia becomes more pronounced when the patient attempts to walk with his eyes closed. He presents a coarse intention tremor of the left hand. There is no tremor of the right hand. The dynamometer registers with the right hand 50; with the left hand 49. The movements of the left hand are decidedly awkward in executing the grip. There is no ataxia of the right arm. Coarse intention tremor or atactic movements of the left hand and arm are revealed when the attempt is made to touch the nose, chin and ear with the forefinger. There is no facial inequality. There is no paresis of any of the facial muscles. The tongue is protruded in the median line and is indented by the teeth.

An examination of the eyes fails to reveal any optic neuritis. There is, however, present a distinct nystagmus which is elicted when the eye-balls are rotated to either side. It is equally marked in both eyes. It is not a to and fro vibratory movement, but an irregular atactic movement. It is not elicited upon upward or downward movements. The pupils are equal and respond promptly to light. Reaction to accommodation and convergence is perhaps a trifle sluggish. There are no contractures of the visual fields.

The knee-jerks are slightly plus, but appear to be readily exhausted. They are equal. There is no ankle clonus. The bicipital reflex is present upon either side and equal. The elbow-jerks are also present and equal. There are no sensory losses; there is no loss of the muscular sense; no loss of the stereognostic sense. The patient complains of a dull feeling about the left angle of the mouth and adjacent portions of the upper and lower lips, but no actual sensory loss can be detected.

The patient sleeps well, but is nervous and easily upset. His hands are cold and damp. He suffers from palpitation of the heart. Has ringing in the ears and is dizzy. Hearing is somewhat impaired upon both sides. He hears an ordinary watch at a distance of two and a half inches from the left ear and five inches from the right ear. He adds, however, that he has always been hard of hearing. He also complains of a nervous sensation in the back of the neck and of pain and headache in the region of the scars.

Because of the intense headache and because of the ataxia and tremor of the left arm, an exploratory operation in the right frontal region was advised, but was negatived by the patient.

He now disappeared from observation and did not again present himself until September 12 of the same year. This time his condition was as follows: Station much impaired. Stands fairly well upon either foot alone. Gait still slightly ataxic, but much less so than upon former examinations. Swings his legs slightly forward and brings his feet down on the floor with a flop. Still has some intention tremor and ataxia of the left arm. The right hand registers with the dynamometer 72; the left hand 64. The pain and headache are much less. The knee-jerks are about normal. Eye symptoms unchanged.

Re-examined, December 20, 1899. Is not able to work because of lack of confidence in himself. States that he is liable to fall over toward his left side. On December 4th he had an attack of unconsciousness. He did not, however, have a convulsion. The right knee-jerk is slightly minus; the left knee-jerk about normal. His general physical condition is improved. Gait is much less ataxic, but he throws the left leg a little awkwardly still. The ataxia of the left hand is still present, but diminished. Says that his left arm feels almost as strong as before.

Re-examined May 4, 1900. Has worked for two months. On Easter Monday, April 16, had a second attack of unconsciousness. He was reading a newspaper when his mother noticed that he suddenly rose to his feet,, stretched out both of his arms, rolled his eyes and became unconscious. He also moved his head slightly to and fro. The patient states that he did not know that an attack was coming on nor was he afterwards aware that anything unusual had occurred, save from the statement of his mother. After this attack, however, he had severe frontal headache, and also felt very sleepy; he was very weak, especially from his knees down, and his mother put him to bed.

Re-examined as follows: Station slightly plus. Stands well upon the right foot but with difficulty upon the left. Some intention tremor of the left hand. Right hand (dynamometer) 73; left hand 58. Peculiarities of gait noted at previous examination still present. The left leg is still ataxic, and the patient complains of a sense of awkwardness in the left leg. Distinct ataxia of the left arm is also still present. There is in addition now a slight hypesthesia of the left arm. The knee-jerk of the left leg is now minus. The right knee-jerk is prompt, though not exaggerated. Eye condition as at first examination.

The patient now finally consented to the oft-repeated advice to submit himself to surgical interference, and on May 24, he was operated upon by Dr. W. W. Keen.

Dr. Keen turned down a large osteoplastic flap in the right fronto-parietal region, the anterior border beginning just at the border of the hair, the posterior somewhat back of the fissure of Rolando. The dura toward the anterior portion of the opening was distinctly yellowish in color and the brain was softer to the touch than the posterior portion. The dura was now turned down and found over an area of about 4 or 5 cm. adherent to the pia mater so that it required considerable force to separate it. As a result of this separation, several vessels had to be ligated to check the hemorrhage. Pressure at this portion of the brain for the purpose of arresting hemorrhage produced very distinct pitting, such as one sees over the tibia in edema of the leg. In order to determine whether there was any cyst or other abnormality, Dr. Keen punctured the brain at a depth of 3 cm., but found nothing. An incision into it showed that the cortex was considerably darker and redder in color than normal. The dura was then closed with silk and the flap with silk-worm-gut. The region of the cortex especially involved was evidently the posterior portion or foot of the second frontal convolution. The patient made a perfectly smooth recovery; only one day was the temperature above 100°. He went home June 1, a week after the operation, the wound being entirely healed.

He was re-examined June 25, 1900. Pain and headache had entirely disappeared, but the general physical signs were the same as previous to the operation. There was still present a slight ataxia of the left arm and left leg. Both knee-jerks were minus. Nystagmus was still present upon deviation to either side.

October 22, 1900, the patient again presented himself. He had had an epileptic seizure three days previously, the first since the operation. The attack was attended by unconsciousness and as far as could be learned, the convulsive movements involved both arms and both legs. Strange tickling sensations persisted at the site of the old injury for some time after the attack.

He presented himself subsequently at intervals of two or three months, until January 11, 1902. The epileptic seizures had not recurred. All trace of ataxia in the left leg had disappeared, his gait and station were entirely normal. Ataxia also had almost entirely disappeared from the left arm. Lateral nystagmus, however, was still present in both eyes. No plantar reflex could be elicited upon either side.

He was last seen by me on July 9, 1903, when the following note was made. Ataxia is still absent. He stands very well upon either leg alone. Both knee-jerks normal at present. Has a disappearing intention tremor in the left hand. Slight awkwardness of movement is still noticed in the left hand in executing movements of precision. Still has nystagmus on lateral deviation toward either side, more marked in conjugate deviation to the left. There is no astereognosis. No feeling of numbness in the hands. Patient complains that he is unable to do hard work. Has a sensitive spot in the right temple. Has not had an epileptic attack for over a year. Is learning cabinet and pattern making. Is very seldom troubled with headache, but often has ringing in the ears.

The above case is especially interesting because of the presence of ataxia and nystagmus. It is well known that tumors and other lesions of the frontal lobe may give rise to ataxia, an ataxia which is sometimes bilateral, as in the present case. Attention was years ago directed to this fact by Bruns, Oppenheim, Wernicke and others. As regards the nystagmus or atactic movements of the eye-balls, the fact that the second frontal convolution is a center which stands in direct relation to the eye movements is most suggestive. Ferrier, Beevor and Horsley, Mott and Sherrington have demonstrated the associated eye movements of this region experimentally. Conjugate deviation and turning of the head have also been noted in man in lesions of this region. Nystagmus or ocular incoordination had not, however, been observed. Just as this paper was being prepared, a report of a similar case by Klien appeared in the *Zeitschrift für Nervenheilkunde,* Vol. 26, 1904, page 327. Klien places upon record a case of incoordination of the eye movements after trauma of the head, producing a superficial lesion of the foot of the second frontal convolution. The symptom observed was especially that of horizontal nystactic movements. General ocular incoordination, however, appears to have been present for while almost continuous horizontal nystactic movements occurred upon attempting to use the eyes, the attempt to fix the eye on a definite point produced irregular movements in the most diverse directions. Among others pronounced slow rotary movements were observed. Further in Klien's case, the right eye presented these disturbances of motion in greater degree than the left;—the trauma was on the left side of the brain. In my case the movements were present in equal degree upon the two sides. In Klien's case it was especially observed that both eyes acted extremely independently of each other. Nothing of the kind was observed in my case. In Klien's case on the other hand, there was no ataxia of the arms or legs and no epilepsy. There was, however, decided loss of sensation upon the entire right half of the body both to touch and pain. The right extremities were somewhat paretic, the right arm more than the right leg. While the two cases resemble each other, they were not therefore exactly parallel.

It is interesting to note that while the ataxia of the extremities in my case finally disappeared, the nystagmus steadily persisted. Had these symptoms been present in a lesion not caused and not readily localizable by the trauma, the ataxia and the nystagmus would have at once directed the attention of the observer to the cerebellum. It must perhaps be admitted that trauma causing a lesion of the frontal lobe might also cause a lesion of the cerebellum. This possibility must, however, be regarded as a remote one. It is significant further that while the ataxia was bilateral, it was much more marked in the left leg and persisted for a much longer period than in the right, the trauma having taken place in the right frontal region.

The case also teaches a valuable practical lesson as regards the convulsive seizures. These were general in character and not focal. The patient, at the beginning of an attack would rise to his feet and extend both arms; that is, there would be a simultaneous disturbance of the innervation of both halves of the body, although the lesion giving rise to the disturbance was a limited one. That this lesion was the cause of the seizures is proven by their disappearance after the surgical operation. The logical inference is that in lesions of the foot of the second frontal convolution, which give rise to epilepsy, the epilepsy is not necessarily focal. Probably this inference applies to other portions of the frontal area as well.